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ABSTRACT

Patterns of student performance were examined in a personalized instruction (PSI) course. Introductory psychology students (N=65) were randomly divided into a completely self-paced group and a group that had an early, instructor-imposed deadline. It was hypothesized that the early deadline group would respond at a more even pace throughout the course than the completely self-paced group. The data supported this hypothesis. Students in the deadline group paced their exam-taking rather evenly across the term, while the self-paced group exhibited a typical flurry of activity toward the end of the term. In addition, attempts were made to predict patterns of performance from a number of relevant variables using multiple regression. Achievement motivation and organizational skills accounted for the most variance in pacing behavior, with motivation/interest in college study habits and GPA accounting for significant portions of the variance. (Author)

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The Modification and Prediction of Procrastination in a Personalized Instruction Course

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Running Head: Procrastination in PSI

The Modification and Prediction of Procrastination in a Personalized Instruction Course

The teaching efficacy of personalized instruction (PSI) has now been clearly established (see Kulik, Kulik, & Cohen, 1979), and so recent research has focused upon variables that facilitate the PSI instructional process. Proctor training (Lazar, Soares, Gonez, & Terman, 1977; Robin & Cook, 1978), bonus points for early exam taking (Bitgood & Seagrave, 1975; Powers, Edwards, & Hoehle, 1973), and size and format of units (Born, 1975; Semb, 1974) have all been studied in this regard. Other researchers have investigated some of the problems associated with the use of PSI, like procrastination in test-taking. The procrastination, or "pacing" problem, involves the tendency of many students to delay coursework until late in the term, when they attempt to complete many units in a short time. This, of course, puts a burden on both these students and their proctor staff. Moreover, research has shown that the point at which students start their coursework is highly predictive of their final course grade. Procrastinators, in general, are likely to receive lower grades than others in a PSI course (cf. Allen, Glaz, & Cherney, 1974; Benassi, Note 1; Henneberry, Note 2; 1978; Powers & Edwards, 1974; Sheppard & MacDermont, 1970). Lloyd and Knutzen (1969) found similar results, but also reported that once students got started, they worked at a constant rate. Apparently, early responding provides students with a more realistic view of grading contingencies. Lloyd and Knutzen (1969) suggested that if some means of inducing students to start working sooner were developed, then more students should do well.

One means of getting students to begin their coursework early in the

term is to impose deadlines. Instructor-set deadlines have been used with some success in PSI, but they have typically been extended across the entire term in an attempt to keep students working at some minimum pace (cf. Bijou, Morris, & Parsons, 1976). While effective in terms of student performance measures, such contingencies are clearly in opposition to the self-paced philosophy of PSI, and data show them to be liked less by students than completely self-paced courses (cf. Kulik, Kulik, & Carmichael, 1974).

To date, no experimental research has compared a forced early start group, involving a few instructor-imposed deadlines, with a completely self-paced group, as suggested by Lloyd and Knutzen (1969). The studies on procrastination cited earlier were all correlational, yet they suggest that if a group could be experimentally exposed to an early start, then better outcomes might be attained, and students might avoid the end-of-semester pressure to finish. Although the imposition of a deadline does constrain self-pacing to some extent, it is still fairly consistent with the philosophy of PSI, and therefore superior to a procedure that extends deadlines throughout the term.

To investigate the procrastination problem more closely, a PSI course in introductory psychology was divided into two groups: a completely self-paced group, and a group with one early-term instructor imposed deadline. It was predicted that the latter group would respond more uniformly across the course term.

Method

Subjects

The participants were 65 students from an introductory psychology

course taught at California State University, Dominguez Hills. Confidentiality was assured by the use of code names (chosen by the participants) to identify all questionnaire responses. After completion of the course, the students revealed their code names to the instructor.

Procedure

During the first course meeting, students were given a detailed explanation of the course design, and asked to complete a number of questionnaires, including: Rotter's (1966) Internal-External Scale; two parts of the Edwards Personal Preference Schedule (1954) the achievement motivation and tendency to procrastinate subscales; the Study Skills Survey (Christ, 1968); the Student Interest/Motivation Scale (Simon, Note 3), which has several subscales including organizational skills, and interest/motivation in college; and, a special demographic questionnaire. Altogether, the students completed six questionnaires over the course of the first three course meetings. They were then divided into a completely self-paced group and a modified self-paced group. The students were told, as a cover story, that "many attempts at applying PSI have failed because record keeping and time constraints have been too much of a burden on both the students and instructor." They were then informed of a plan that would hopefully resolve this problem. It was announced that students whose social security numbers ended in an even number would be required to take the first exam in a week's time, in order to "get the course moving." The rest were told that they could take the first exam at the same time if they so desired, and were encouraged (but not required) to do so. The impact of the deadline was lessened to a great extent by reiterating the fact that no penalities are

ever imposed for failing an exam in PSI. Although the students were informed that the questionnaire data would be used for a research project on "characteristics of students in PSI courses," they were not aware of their involvement in an experiment on pacing. Moreover, the proctors were not aware of an experiment in progress nor of the treatment group students were assigned to.

Results

First, the effect of our simple treatment was noted on objective performance measures, the number of units passed and grade received. Although not predicted, a one-way ANOVA performed on the number of units passed illustrates a trend for the early deadline group to complete more units, F (1,64) = 3.0, $p < .09$. An identical analysis also shows a slight trend for that group to achieve better grades, F (1,64) = 2.65, $p < .12$. Thus, the imposition of an early deadline did seem to improve the students' performance, however the effect was small and nonsignificant.

Insert Figures 1 & 2 about here

As predicted, the effects of our treatment variation on the pattern of work completion is more interesting. The cumulative percentage of units completed for the two groups, as well as an "ideal pace" line is shown in Figure 1. This ideal-pace line represents the most even and uniform pace a student could possibly maintain (e.g., in a ten week course 1/10 of the course work would be completed by the first week). The results show that the early deadline group adhered more closely to the ideal pace than the self-paced group. Figure 2 is perhaps a better depiction of unit completion times since

it shows that the self-paced group waited until the last third of the course to complete a large percentage (55%) of their units, in sharp contrast to the early deadline group, who distributed their work rather evenly across the term.

Insert Table 1 about here

A more precise index of pacing behavior is the inter-quiz interval, or IQI. The IQI is the number of days between mastery on one unit and the first attempt on the next (Lazar, Soares, & Terman, 1977). For example, a low IQI indicates that students are not procrastinating, but responding relatively rapidly. An ANOVA computed on these data (see Table 1) shows that the early deadline group had a significantly shorter IQI for the first half of the course (F (1, 283) = 4.35, $p < .03$), but that this pattern reversed itself in the second half of the course when the self-paced group had the shorter IQI (F (1,388) = 2.8, $p < .05$). Apparently, the self-paced group had a flurry of activity during the second half of the course, relative to our early deadline group. These data provide solid evidence that the early deadline led to less procrastination among the students.

Despite its apparent effectiveness in combating procrastination, the imposition of deadlines in a PSI course is still something of a departure from traditional practice. In addition to modifying poor pacing behavior, it would be useful to be able to predict its occurrence, so that remedial efforts could be directed only to those individuals in need of such help. A remedial effort based on such a prediction might well optimize performance for all students, since it is already known that poor pacers achieve

lower grades (Allen, et al. 1974; Henneberry, 1976). Previous research in this area has dealt mostly with predicting student performance from a number of relevant variables (e.g., Henneberry, 1976; Roberts, Meier, Santogrossi, & Moore, 1978). We decided to attempt to predict how students pattern their work, using variables that are relevant to self-motivation; like need for achievement, locus of control, interest and motivation in college, study habits, and organizational skills. Several demographic variables were also employed, including GPA, number of units carried during the term, and work hours per week/self reported income.

In an attempt to predict pacing behavior, Pearson product-moment correlations were first calculated for all predictor variables with the IQI measure (see Table 2). Significant negative correlations were obtained between IQI and achievement motivation ($r = -.30$, $p < .01$), organizational skills ($r = -.16$, $p < .05$), and interest/motivation in college ($r = -.16$, $p < .01$). These correlations indicate that a higher need for achievement, better organizational skills,and more interest and motivation in college, lead students to move through PSI course material more quickly. Significant positive correlations were obtained between IQI and tendency to procrastinate ($r = .14$, $p < .05$) and self-reported income ($r = .14$, $p < .05$). Apparently, the more students tend to procrastinate in general, and the higher their self-reported income is, the less quickly they move through course material. The latter result may be due to the fact that many of the students at this university held full or part-time jobs, thus allowing less time for their studies.

Insert Table 2 about here

The multiple regression (stepwise inclusion) model we tested on these data was fairly effective in predicting procrastination (IQI), reaching a multiple correlation of .63, and accounting for 40% of the variance in procrastination (see Table 2). The two most important predictors of procrastination were need for achievement, and organizational skill, accounting for 9% and 8% of the variance respectively. In all, a total of nine significant predictors were selected via this step-wise procedure. The analysis of variance computed on the regression model was significant, F (9,52) = 2.79, $p < .01$.

Discussion

It appears that procrastination can be alleviated to some extent by imposing one early-term deadline that forces students to immerse themselves in the material. This result has several implications for procrastination in PSI. First, procrastination may not be as difficult a problem as it has been portrayed, if it can be reduced by such simple means. While only marginally effective in producing better performance, our treatment had a strong and beneficial impact on the pattern of student performance. Poor pacing is a major complaint against PSI in the literature, yet little has been done to solve it. This study showed that some of the deleterious effects of poor pacing can be overcome by a simple procedure. In combination with other methods designed to increase student work rates (cf. Bitgood & Seagrave, 1975; Keenan, Bono, & Hursh, 1978; Powers, et al. 1973), an early instructor-imposed deadline could help to provide a maximally effective instructional environment.

The present findings also indicate that there are individual differences among students with regard to their pattern of responding throughout the

course term. Those students who proceed through the course at a fast rate tend to be higher in need for achievement, more motivated and interested in college, have better organizational skills and tend to procrastinate less in general life situations than those who move through the course slower. Thus, self-motivation kinds of variables seem to be an important contributor to pattern of responding in PSI courses. Since PSI requires a great deal of individual preparation and planning it is not surprising that organizational skills are also a predictor of pacing behavior. Additionally, that hours of work per week was negatively correlated with progress rate suggests that students with demanding outside committments are not well-suited for PSI types of courses.

Several limitations of the predictive model portion of this study should be noted. First, predictions from regression models have often ignored the fact that the obtained squared multiple correlation (R^2) represents only the predictive value of that variable set with the sample from which it was derived. Thus, the relative strength of the prediction model reported here may vary with other samples. Second, only about 40% of the variance in pacing behavior can be accounted for with this predictor variable set; obviously other, perhaps more relevant, variables should be identified. With future work done in the area of predicting pacing behavior, some stable and reliable predictors may be identified which could be used to counsel students likely to procrastinate.

Although the "pacing" problem is especially important in PSI, it may be characteristic of traditional courses as well. Of course, in the traditional course such imformation about procrastination is usually unavailable to the instructor. Indeed, one clever study (Born & Davis, 1974) investigated

students' self-reports of studying behavior in traditional and PSI courses. Their results showed that traditional courses are also plagued by a similar pacing problem. Since past college performance has consistently been shown to be the most significant predictor of success in PSI and traditional courses, perhaps it is not the nature of the self-paced course itself, but the characteristics of the individual student that determines procrastination in PSI. The procrastinator is PSI may be the procrastinator in traditional courses as well. A change from self-paced methods to traditional ones could thus be irrelevant to these students anyway. This suggests that the PSI approach offers the most benefits to all individuals. The fast starter is equally skillful in all types of courses, and the slow-starter (procrastinator) is permitted the freedom to delay in the PSI course, often with no deleterious effects. The self-paced method is certainly not likely to hinder a slow-starter's performance compared with a traditional course, and may even offer the student an opportunity to catch up, as indeed they sometimes do (cf. Bijou et al. 1976).

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Footnotes

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Table 1

ICI Values as a Function of Pacing Condition and Portion of Course

Condition	$\bar{X}$	S.D.	N
Completely Self-paced			
First Half	3.23	2.39	119
Second Half	1.95	2.01	180
Modified Self-paced			
First Half	2.67	2.11	165
Second Half	2.41	1.98	209

Table 2

Multiple Regression Predicting IQI from Variable Set

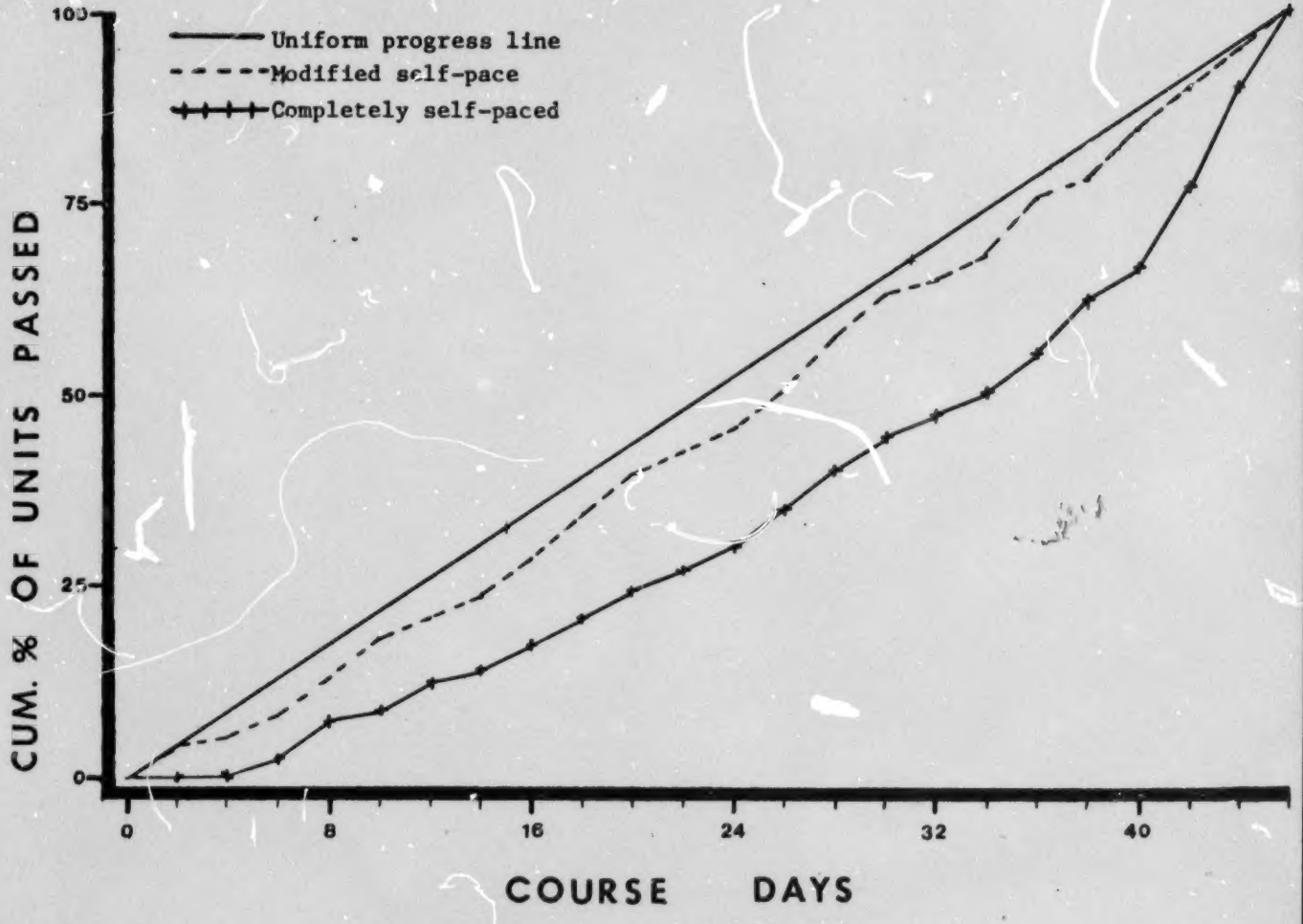
Variable	Multiple R	R Square	R Sqr Change	Simple r
Ach. Motivation	.30	.09	.09	-.30
Organ. Skills	.40	.16	.08	-.16
Ten. to Procrastinate	.48	.23	.07	.14
Int/Mot. in College	.53	.28	.05	-.25
Pacing Condition[1]	.57	.33	.04	.14
GPA	.61	.37	.04	.06
Self-income	.62	.38	.01	.11
Rotter I-E	.63	.40	.02	-.07
Study Habits	.63	.40	.00	-.08

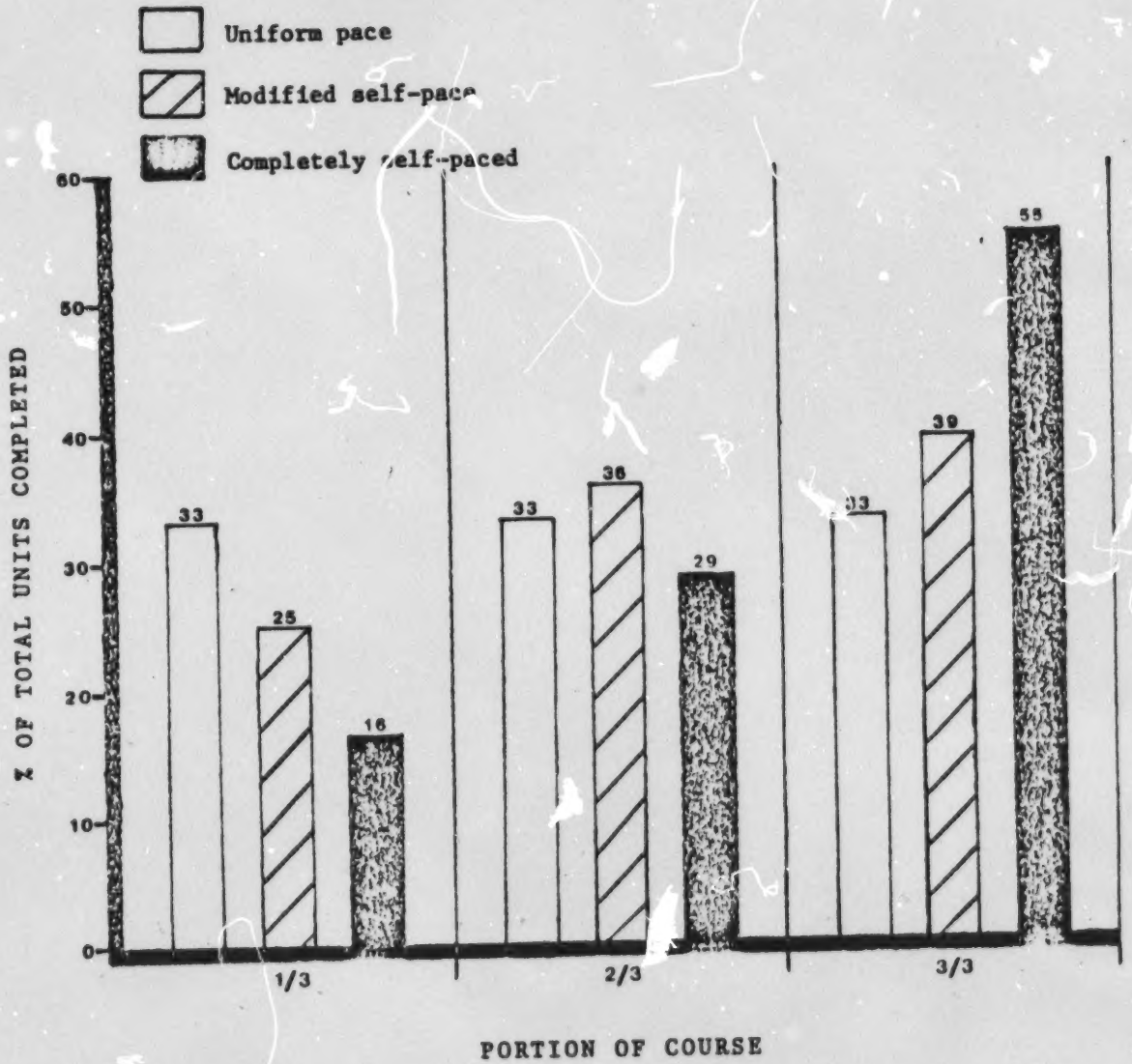
[1] Because our experimental manipulation of pacing condition was significant, it was necessary to include it as a possible predictor in this section.

Figure Captions

Figure 1: The cumulitive (mean) percentage of quizzes passes per group by course days.

Figure 2: Percentage of total units completed at each third portion of course for pacing conditions.


Uniform progress line
Modified self-pace
Completely self-paced
CUM. % OF UNITS PASSED
100
75
50
25
0
0
8
16
24
32
40
COURSE DAYS


Uniform pace
Modified self-pace
Completely self-paced
% OF TOTAL UNITS COMPLETED
60
50
40
30
20
10
0
33
25
16
33
36
29
33
39
55
1/3
2/3
3/3
PORTION OF COURSE